Routinization-Biased Technological Progress, Offshore Outsourcing and Rising Job Polarization: 
A Simple Model with Heterogeneous Agents

First and still preliminary version.

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Abstract

Job polarization with rising employment shares in the highest- and lowest-wage occupations has recently been highlighted both in the U.S. (Autor, Levy and Murnane, 2003, Autor, Katz and Kearney, 2006) and in Europe (Goos and Manning, 2007, Goos and Manning and Salomons, 2009). In this paper, we propose a simple two-sector general equilibrium model with heterogeneous labor and imperfectly competitive firms that make explicit offshore outsourcing decisions in a globalized world. We investigate the effects, on the wage and the employment distributions, of alternative potential causes that have been proposed in the literature to explain job polarization. We conclude in favor of the routinization-biased technical progress proposed by Autor, Levy and Murnane (2003).

Keywords: Routinization; Skill-biased technological change; Job polarization; Offshore outsourcing; Heterogeneous agents

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1 Introduction

Job polarization with rising employment shares in the highest- and lowest-wage occupations has recently been highlighted both in the U.S. (Autor, Levy and Murnane, 2003) and in Europe (Goos and Manning, 2007, Goos, Manning and Salomons, 2009). Goos and Manning, 2007, have also stressed that, surprisingly, a $U$ shape change in the wage distribution does not seem to result. These labor-market transformations are not entirely consistent with the dominant idea of skill-biased technological change as a hypothesis about the impact of technology on the labor market. Autor, Levy and Murnane (2003) have proposed, and empirically investigated, an alternative "routinization" explanation. Autor, Katz and Kearney (2006) propose a theoretical argument to explain the observed job polarization. Their argument is however partial equilibrium: focussing on technology, it abstracts from interaction between labor and product markets, and therefore with trade and the globalization of the world economy.

In this paper, we propose a simple two-sector general model with heterogeneous labor and imperfectly competitive firms that make explicit offshore outsourcing decisions in a globalized world. The model we use is adapted from our previous work on offshore outsourcing (see Jung and Mercenier, 2008), that builds on Yeaple’s (2005) heterogeneous agents framework. We investigate the effects, on the wage and the employment distributions, of alternative potential causes that have been proposed in the literature: a routinization-biased technical change, the globalization of the world economy, shifts in preferences due to population ageing, and negative changes in the quality of the labor supply. Our theoretical discussion leads to a rejection of the latter three candidate explanations, and concludes that the routinization-biased technical progress is the only one that seem to be able to reproduce the stylized facts: rising employment shares at the two extremes of the skill ladder, and monotonously rising average wages with the skill intensity of occupations. We then provide numerical simulations that confirm our discussion.
2 The Model

Our model is a two-region North-South model, though our focus is on the domestic economy and the South will therefore remain essentially implicit.

2.1 Households

Domestic households have Cobb-Douglas preferences combining consumption goods from two different sectors, \( X \) and \( Y \). Industry \( X \) produces a continuum of differentiated varieties, whereas goods from industry \( Y \) are homogeneous. We write household preferences as:

\[
Con = \beta \ln X + (1 - \beta) \ln Y \quad 0 < \beta < 1 \quad (1)
\]

\[
X = \left[ \int_{i \in N} x^d(i)^\rho di \right]^\frac{1}{\rho} \quad 0 < \rho < 1 \quad (2)
\]

where \( i \) indexes the varieties within sector \( X \) and \( \sigma = 1/(1 - \rho) \) is the differentiation elasticity. Maximizing utility subject to income immediately yields:

\[
P_{Con} \cdot Con = Inc \quad (3)
\]

\[
\ln P_{Con} = \beta \ln P_X + (1 - \beta) \ln P_Y \quad (4)
\]

\[
x^d(i) = \left( \frac{P_X}{p(i)} \right)^\sigma \frac{\beta Inc}{P_X} \quad (5)
\]

\[
P_X = \left[ \int_{i \in N} p(i)^{1-\sigma} di \right]^\frac{1}{1-\sigma} \quad (6)
\]

\[
p_Y Y = (1 - \beta)Inc. \quad (7)
\]

Domestic households also supply labor from a continuum of workers with unit mass, differentiated by skill level \( z \) with cumulative distribution \( G(z) \) on support \([z_{min}, z_{max}]\).

2.2 Firms and the labor market

Industry \( Y \) is competitive and non-traded. We have in mind here the production of tasks that are typically interactive and therefore cannot be routinized, even though they require poorly qualified labor. The technology used for producing these tasks is assumed Ricardian in labor.
In the $X$-industry, each final-good variety is produced by a single firm. Output $x(i)$ of any variety requires combining two types of activities within a firm: the first are non-repetitive conceptual activities, that are typically associated with white-collar headquarter services, and the second are repetitive tasks—dominantly though not exclusively blue-collar jobs. Both activities are associated with the production of intermediate components, respectively in amount $h(i)$ and $m(i)$. We assume a Leontief production function with units conveniently chosen so that:

$$x(i) = h(i) = m(i).$$  \hspace{1cm} (8)

Both activities are performed by workers using Ricardian technologies. There are two competing technologies available for producing $h(i)$, a high- ($H$) or a low- ($L$) technology. Technology $H$ is more expensive to set-up but cheaper to operate than $L$ so that $F_L < F_H$ and $C_L > C_H$, where $F_j$ and $C_j$ denote respectively the set-up and the marginal costs involved by the use of technology $j = L, H$. Though born identical, firms will sort in equilibrium between these two types: this is one source of endogenously generated firm heterogeneity in the model.

Though headquarter services can only be produced domestically, repetitive intermediate activities can be either performed locally or offshored. In the home country, they involve using an $M$ technology with marginal cost $C_M$; performed in the South, these activities have a lower unit production cost $C^*_M = \theta C_M, \theta < 1$. Offshore outsourcing however involves specific set-up costs $F_I$ so that only the most productive $X$-firms will turn multinational. There is considerable evidence that multinational (MN) firms use more productive technologies than non-MNs,\textsuperscript{1} so we assume $F_I$ and $\theta$ such that only firms using the $H$ technology find it profitable to offshore the production of their repetitive intermediate activities. We define for future use $\theta_j = \{1, \theta\}$ for $j = \{L, H\}$.

Finally, $X$-firms differ from one another, and from $Y$-producers, by the skill level of the domestic workers they hire. Let $\varphi_j(z)$ denote the productivity of a worker of skill $z$ when working with technology $j \in \{Y, M, L, H\}$. We assume $\varphi_j(z)$ continuous and increasing

\textsuperscript{1}It is widely documented that affiliates of multinationals are more productive than national firms; see for example Doms and Jensen (1998), Conyon et al. (2002). In addition, Helpman et al. (2004) highlight also that MNEs are substantially more productive than non-MNE exporters which outperform significantly purely domestic ones.
in $z$, so that, for any technology considered, a higher skilled worker is absolutely more productive than a less skilled one. We characterize comparative advantages as follows:

$$0 < \frac{\partial \varphi_Y(z)}{\partial z} \varphi_Y(z) < \frac{\partial \varphi_M(z)}{\partial z} \varphi_M(z) < \frac{\partial \varphi_L(z)}{\partial z} \varphi_L(z) < \frac{\partial \varphi_H(z)}{\partial z} \varphi_H(z)$$

with $\varphi_Y(z_{\text{min}}) = \varphi_M(z_{\text{min}}) = \varphi_L(z_{\text{min}}) = \varphi_H(z_{\text{min}}) = 1$, so that a higher skilled worker is relatively more productive with more efficient technologies.

In equilibrium, with competitive labor markets, workers will sort between the four technology types according to their respective comparative advantage. Let $z_0$, $z_1$ and $z_2$ be equilibrium skill thresholds with $z_{\text{min}} < z_0 < z_1 < z_2 < z_{\text{max}}$. Then, the least skilled workers, with $z \in [z_{\text{min}}, z_0)$, will be employed in sector $Y$, those with talents $z \in [z_0, z_1)$ will be hired to perform repetitive tasks within $X$-firms, and the more talented, those with $z \in [z_1, z_2)$ and $z \in [z_2, z_{\text{max}})$ will be allocated to conceptual activities in headquarters, respectively in low-tech and high-tech firms. See Figure 1, where we assume log-linear productivity functions $\varphi_j(z)$.

A worker $z$ will therefore earn a wage $w(z)$ that reflects both its talent and the tech-

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All four types of technologies are assumed to be used in equilibrium.
nology on which he operates: the competitive wage distribution will satisfy

\[
w(z) = \begin{cases} 
  C_Y \phi_Y(z) & z_{\min} \leq z < z_0 \\
  C_M \phi_M(z) & z_0 \leq z < z_1 \\
  C_L \phi_L(z) & z_1 \leq z < z_2 \\
  C_H \phi_H(z) & z_2 \leq z < z_{\max}
\end{cases}
\]  

(10)

Obviously, the marginal skill owners should be indifferent in equilibrium between the two adjacent working technologies, so that

\[
C_Y \phi_Y(z_0) = C_M \phi_M(z_0) \\
C_M \phi_M(z_1) = C_L \phi_L(z_1) \\
C_L \phi_L(z_2) = C_H \phi_H(z_2)
\]

and the equilibrium wage distribution is as illustrated in Figure 2.

Figure 2: The equilibrium wage distribution.
$C_Y$ serves as numeraire and the three previous indifference conditions therefore pin down the marginal costs of intermediate tasks in the $X$ industry:

$$
C_M = C_Y \frac{\varphi_Y(z_0)}{\varphi_M(z_0)} \\
C_L = C_M \frac{\varphi_M(z_1)}{\varphi_L(z_1)} \\
C_H = C_L \frac{\varphi_L(z_2)}{\varphi_H(z_2)}
$$

(12) (13) (14)

Observe from (9) that $C_Y > C_M > C_L > C_H$ and that $C_M, C_L, C_H$ are decreasing respectively in $z_0, z_1$ and $z_2$.

Marginal cost pricing holds in the competitive $Y$ industry so that $p_Y = C_Y$. In sector $X$, monopolistic competition prevails and firms therefore charge constant mark-up rates over their marginal production costs:

$$
p_j = \frac{\sigma}{\sigma - 1} (C_j + \theta_j C_M) \quad j = L, H.
$$

(15)

Observe that multinationals will charge lower prices than their national-only competitors.

### 2.3 The foreign economy

Foreign workers earn income from multinationals’ offshored production activities; from our assumptions on technology (8) and on production costs, we know that this can be written as

$$
Inc^* = \theta C_M \int_{z_2}^{z_{\text{max}}} \varphi_H(z)dG(z)
$$

(16)

We avoid unnecessary balance of payment complications by conveniently assuming that this income is spent entirely on imported $X$ goods from the North, with preferences identical to (2), so that each $X$-firm exports in amount

$$
x^{d^*}(i) = \left( \frac{P_X}{p(i)} \right)^\sigma \frac{Inc^*}{P_X}
$$

(17)

where $P_X$ is given by (6).

### 2.4 Equilibrium

$Y$ goods are non-traded, so that domestic production fully covers local household demands:

$$
\int_{Z_{\text{min}}}^{z_0} \varphi_Y(z)dG(z) = Y
$$

(18)
In the $X$ industry, each firm satisfies the demand for its own variety, so that

$$x_j = x^d(i) + x^{d^*}(i) \quad i \in N_j, \quad j = L, H$$  \hspace{1cm} (19)

where $N_j$ is the number of firms of type $j$. Free entry ensures zero profits for both firm types, so that mark-up revenues exactly cover fixed costs. For convenience, we express fixed costs in the form of forgone output and price these accordingly:

$$\frac{1}{\sigma} p_j x_j = (C_j + \theta_j C_M) \cdot (F_j + \delta_j F_I) \quad j = L, H$$  \hspace{1cm} (20)

with $\delta_j = \{0, 1\}$ for $j \in \{L, H\}$.

The amount of labor used in the production of headquarter services follows from the technology (8), as

$$N_L x_L = \int_{z_1}^{z_2} \varphi_L(z)dG(z)$$  \hspace{1cm} (21)

$$N_H x_H = \int_{z_2}^{z_{\max}} \varphi_H(z)dG(z)$$  \hspace{1cm} (22)

Domestically performed repetitive tasks are exclusively concentrated within low-tech firms, so that:

$$\int_{z_0}^{z_1} \varphi_M(z)dG(z) = \int_{z_1}^{z_2} \varphi_L(z)dG(z).$$  \hspace{1cm} (23)

Finally, domestic income follows from full employment,

$$Inc = C_Y \int_{z_{\min}}^{z_0} \varphi_Y(z)dG(z) + C_M \int_{z_0}^{z_1} \varphi_M(z)dG(z) + C_L \int_{z_1}^{z_2} \varphi_L(z)dG(z) + C_H \int_{z_2}^{z_{\max}} \varphi_H(z)dG(z)$$  \hspace{1cm} (24)

which completes the description of our model.

**3 Routinization-biased technological progress (RBTP)**

We now turn to the analysis of the routinization-biased technical-progress hypothesis, which in our model is quite naturally interpreted as a positive technology shock in $M$-activities that affects positively the slope of the $\ln \varphi_M(z)$ schedule in figure 1, within the range consistent with (9). Figure 3 reports the general equilibrium consequences of this shock on employment and wages: the new equilibrium wage distribution is shown in bold.
To understand this equilibrium outcome, we focus on how the skill thresholds \( z_0, z_1, z_2 \) are affected. From (23) it is apparent that, for given \( z_0 \) and \( z_2 \), \( z_1 \) will be reduced: adopting the new technology forces low-tech \( X \)-firms to relocate the most talented workers from their repetitive \( M \)-tasks to their headquarter activities, where they skill-upgrade, now operating on the better \( L \)-technology, and therefore becoming more productive. The wage rise spreads to all headquarter jobs within \( L \)-type and \( H \)-type firms. But the rise in income has boosted the demand for the non-traded good, the relative price of which rises \((C_M \text{ falls})\) making it possible for producers in the \( Y \) industry to hire workers previously
employed in repetitive intermediate activities $M$ by offering better wages: the threshold $z_0$ is being pushed to the right. For given $z_2$, this tends to mitigate the initial leftward shift of $z_1$, obviously without qualitatively affecting the mechanism described (by stability arguments). Observe that, in absence of multinational firms, this would complete the description of the adjustment mechanism to equilibrium: $z_2$ would then coincide with $z_{\text{max}}$ and be fixed by endowments. Observe also that, with $z_2$ up to now unchanged, the cost ratios $C_L/C_H$ and $C_M/C^*_M$ are unaffected by previous adjustments so that the ratio $p_L/p_H$ has remained constant. $X$-varieties from high-tech firms have therefore become relatively scarce: product market equilibrium requires from these firms more output. Increasing the scale of offshored activities is no problem for multinational firms since labor is abundant enough in the South to leave unaffected the marginal production costs of these repetitive intermediate input tasks. In the home country, however, skilled labor has to be pulled out of the national-only competitors. This multinationals achieve by offering better wages so that $z_2$ is shifted leftward, with newly hired workers skill-upgrading as they move to high-tech equipment, therefore becoming more productive. The wage rise spreads to all workers with $z > z_2$ boosting the relative cost of headquarter activities within multinationals $C_H$. This is passed over to $p_H$, inducing demand substitutions that also contribute to restore product market equilibrium. We see that offshore outsourcing by multinational firms tend to amplify the labor markets transformations induced by RBTP.

Clearly, in this economy, RBTP generates unambiguous job polarization of the type recently documented to have emerged in most developed countries during the previous fifteen years: a shrinking share of employment in intermediate mostly repetitive activities, with a labor force being increasingly concentrated in both the lowest- and the highest-wage occupations typically characterized by the non-routinizable nature of the tasks performed.

RBTP also clearly generates changes in wage inequalities that are consistent with observed trends.

What can be said on the effect of RBTP on average wages by occupations in this economy? It is immediate to see that the average wage earned per worker in the $Y$ sector unambiguously rises by a strict composition effect: with $z_0$ shifted to the right, some workers relocate themselves from $M$ tasks to jobs within the sector with the least efficient technology. Though for those individual workers this is a skill-downgrading move
associated with a wage loss, they come with better skill endowments than those previously
in that industry and therefore contribute positively to the average wage \( \bar{W}_Y \).

The effect of \( \text{RPTP} \) on average wages in other occupations is however unclear because
of ambiguous composition effects. Indeed, though wages rise for all workers \( z \in [z_0, z_{\text{max}}] \)
that initially held a job associated with headquarter activities, those newly hired are less
talented and contribute therefore negatively to the average wage index in non-repetitive
conceptual tasks. The same ambiguity prevails regarding the sign change of \( \bar{W}_M \) despite
the contribution of the technological shock on productivity in this sector. This is because
workers that move out of the repetitive activities do so either by skill-upgrading or by skill-
downgrading, and are respectively the most- and the least- talented originally employed in
those industries. We shall resort to numerical simulations, using a parameterized version
of the model roughly fitted on U.S. data, to demonstrate that the model submitted to a
\( \text{RBTP} \) shock is able to generate predictions consistent with the changes in the average
wage distribution by occupations that have recently emerged from the data.

4 Globalization

We have seen how, by offshore outsourcing practices, multinationals will amplify the ef-
teffects of the \( \text{RBTP} \) on labor markets. This might offer an explanation for the fact that, in
empirical work, globalization does come out as a positive though rather minor contributing
factor to labor market bipolarization as compared to \( \text{RBTP} \). To offer this as indirect
support in favor of the latter assumption would be expeditive: we now address the is-
sue of rising globalization as an alternative potential explanation to recent labor market
transformations.

Globalization naturally takes two non-exclusive forms in this model: a fall in the fixed
cost of engaging in offshore outsourcing practices \( dF_t < 0 \), and a reduction of marginal
production costs of repetitive tasks abroad \( d\theta < 0 \), the latter interpreted to include trans-
portation costs. Both technology shocks yield qualitatively identical equilibrium effects:
offshoring becomes increasingly attractive so that more low-tech producers find it profita-
able to turn multinational and switch to high-tech. The contraction of aggregate activity
by national-only \( X \)-firms induces a left shift of both \( z_1 \) and \( z_2 \). Demand for the non-traded
good rises with income, which can only be satisfied by increasing employment in the competitive: \( d_2 > 0 \). As labor pours out of the intermediate M-activity. The new equilibrium wage distribution is displayed in Figure 4. Not surprisingly, this is very similar to figure 3. Observe, however, that there is an important difference. Indeed, with globalization as the causing force, all workers that remain in M-activities suffer a same proportional wage loss, whichever their skill level. In contrast, RBTP unambiguously increases wage inequalities between workers within sectors with dominantly repetitive activities. We therefore have highlighted a difference between two major competing potential explanations of recent labor market transformations, a difference that is presumably identifiable econometrically.

Figure 4: The effect of globalization on the equilibrium wage distribution
5 Other potential explanations

Other explanations have been proposed in the literature to cause recent labor market transformations. We here argue against two of these.

5.1 A composition shift of demand towards skill-unintensive services

An ageing population is likely to increase its demand share for services such as outside-family care and hospital assistants, that is, towards non-easily routinized tasks that can typically be performed by low-skilled low-payed workers. Also, it has been suggested that rising wage inequalities may have contributed to displaced demand in favor of low quality jobs because of the relatively high income elastic nature of demand for services such as child care. How will such shift in preferences impact on the labor market?

The answer is provided in Figure 5, where it is shown that no job polarization can emerge, which leads to rejection of demand composition shifts as a potential causal explanation. To see why, consider the effects of an exogenous reduction of $\beta$ in (1). The impact effect is to increase the relative price of the competitive good, as well as wages in that industry ($dC_M = d_1C_L = d_1C_H < 0$), making it attractive for lower-skilled $M$-workers to move into the Y industry: $z_0$ shifts to the right. With $z_2$ given, low-tech $X$-firms are forced into restructuring, reducing wages in oversized headquarter activities ($d_2C_L < 0$); the least talented among the workers engaged in such activities now find it profitable to skill-downgrade and perform $M$-tasks within the firm: $dz_1 > 0$. Wage cuts in $L$-tech headquarter jobs have spread to multinational competitors who now can afford to reduce pays to their own headquarter workers in identical proportions ($d_2C_H = d_2C_L$) without affecting the size of their labor force ($dz_2 = 0$). With $z_2$ unchanged, however, there is excess supply of goods of the high-tech varieties: to restore product market equilibrium, multinational producers will be forced to lower prices ($dp_H < 0$) by cutting into headquarter wage costs. This is achieved by adjusting wages down ($d_3C_H < 0$) and downsizing their labor force: $dz_2 > 0$. (Those workers who leave join $L$-tech firms, where their talent is now better valued).
Figure 5: The effect of population ageing on the equilibrium wage distribution.

5.2 Quality changes in labor supply

It has also been suggested that changes in the quality of labor supply could explain the recent transformation of the job and wage distributions. Indeed, a sharp slowdown in skill supply growth has been observed on the period 1980 to 2005, at least in the U.S. (Goldin and Katz, 2007). We can evaluate the explanatory power of such factors using our model by playing with the form of the cumulative distribution of talents $G(z)$ on support $[z_{\text{min}}, z_{\text{max}}]$. Think of the underlying density distribution $g(z)$, as initially uniform, and
being transformed into a negative exponential with unchanged mass. How would this affect the general equilibrium of our economy?

It should be obvious that this can only result in a leftward shift in the equilibrium wage threshold $z_0$. The sign and change of $z_1$ will crucially depend on how easily low-tech firms are able to entice workers away from their headquarter jobs within multinationals. If the difference in technology is small, a modest wage rise will suffice to induce a large enough number of workers to leave their high-tech employers: $z_2$ will shift right, and the aggregate output of $X$ national-only firms will unambiguously expand. But rising activity by low-tech firms implies more repetitive jobs in $M$-type activities, which is inconsistent with the stylized facts we try to explain. In the opposite case where the gap between $L$ and $H$ technologies is large, enticing headquarter workers from multinational firms is costly. Consider, to ease reasoning, that $z_2$ remains essentially unaffected. The balance between input activities is then achieved by moving the best workers out of the $M$- and into the $L$-type jobs. The equilibrium left shift of $z_2$ will clearly be modest compared to that of $z_0$ because the newly hired (those with $z < z_0$) are relatively less skilled and therefore less productive. This implies a rising share the jobs in $M$-activities, a conclusion in contradiction with observation. Figure 6 illustrates this last case.

We conclude that it seems unlikely that changes in the quality of labor supply would induce labor market transformations that have been recently observed. The conclusion is confirmed by the numerical simulation analysis reported in the next section.
Figure 6: The effect of changing labor supply quality on the equilibrium wage distribution

6 A numerical appraisal

In this section, we use a numerical version of the model

6.1 The initial equilibrium
For household preferences, we choose:

\[ \beta = 0.80 \]
\[ \sigma = 4 \]

and a uniform density distribution \( g(z) \) of skills.

Technologies are assumed log-linear, consistently with figure 1. We set:

\[ \ln \varphi_Y(z) \approx 0.930 \]
\[ \ln \varphi_M(z) \approx 1.025 \]
\[ \ln \varphi_L(z) \approx 1.435 \]
\[ \ln \varphi_H(z) \approx 1.575 \]

Relative fixed costs are somewhat chosen arbitrarily so that \( \theta \approx 0.90 \):

\[ FL = 1.00 \]
\[ FH + FI = 1.62 \]

The equilibrium skill thresholds are then chosen as:

\[ z_{\text{min}} \approx -0.65 \]
\[ z_0 = 0.0 \]
\[ z_1 = 0.70 \]
\[ z_2 = 1.00 \]
\[ z_{\text{max}} \approx 1.05 \]

The resulting employment and GNP shares by activities are obtained in the initial equilibrium:

<table>
<thead>
<tr>
<th>Sector/Activity</th>
<th>% Jobs</th>
<th>% GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector Y</td>
<td>0.38</td>
<td>0.20</td>
</tr>
<tr>
<td>Activity M</td>
<td>0.41</td>
<td>0.42</td>
</tr>
<tr>
<td>Activity L</td>
<td>0.18</td>
<td>0.32</td>
</tr>
<tr>
<td>Activity H</td>
<td>0.03</td>
<td>0.06</td>
</tr>
</tbody>
</table>
6.2 Numerical appraisal of each hypothesis

Table 1 reports the computed effects (as indices) of the different alternative shocks on job shares, average wages and wage inequalities. The results for job shares and average wages are also graphed below, as % changes. We see that the only shock that produces effects consistent with the stylized facts is the routinized-biased technical-progress hypothesis.

<table>
<thead>
<tr>
<th>Employment share</th>
<th>Base</th>
<th>RBTP</th>
<th>Globalization</th>
<th>Ageing population</th>
<th>Labor supply quality change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1,000</td>
<td>1,00336</td>
<td>1,01372</td>
<td>1,02822</td>
<td>1,00017</td>
</tr>
<tr>
<td>M</td>
<td>1,000</td>
<td>0,99480</td>
<td>0,85054</td>
<td>0,97968</td>
<td>1,01441</td>
</tr>
<tr>
<td>L</td>
<td>1,000</td>
<td>1,00085</td>
<td>0,94060</td>
<td>0,98725</td>
<td>0,98387</td>
</tr>
<tr>
<td>H</td>
<td>1,000</td>
<td>1,02526</td>
<td>3,37861</td>
<td>0,99451</td>
<td>0,88772</td>
</tr>
<tr>
<td>L+H</td>
<td>1,000</td>
<td>1,00420</td>
<td>1,27527</td>
<td>0,98824</td>
<td>0,97067</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average wage per job</th>
<th>Base</th>
<th>RBTP</th>
<th>Globalization</th>
<th>Ageing population</th>
<th>Labor supply quality change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1,000</td>
<td>1,00112</td>
<td>1,00457</td>
<td>1,00944</td>
<td>0,96191</td>
</tr>
<tr>
<td>M</td>
<td>1,000</td>
<td>1,00394</td>
<td>0,95009</td>
<td>1,00896</td>
<td>0,94671</td>
</tr>
<tr>
<td>L</td>
<td>1,000</td>
<td>1,00565</td>
<td>0,89352</td>
<td>0,99954</td>
<td>0,99176</td>
</tr>
<tr>
<td>H</td>
<td>1,000</td>
<td>1,00679</td>
<td>0,96810</td>
<td>0,99679</td>
<td>1,02062</td>
</tr>
<tr>
<td>L+H</td>
<td>1,000</td>
<td>1,00662</td>
<td>0,98112</td>
<td>0,99931</td>
<td>0,99310</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage inequality</th>
<th>Base</th>
<th>RBTP</th>
<th>Globalization</th>
<th>Ageing population</th>
<th>Labor supply quality change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(90/10)</td>
<td>1,000</td>
<td>1,00531</td>
<td>1,02708</td>
<td>0,99762</td>
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<td>Log(90/50)</td>
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<td>1,00744</td>
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<td>0,99782</td>
<td>1,06325</td>
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<td>Log(50/10)</td>
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<td>1,00279</td>
<td>0,99873</td>
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</tbody>
</table>

Table 1: Computed effects of alternative shocks.

7 Conclusion

In this paper, we have propose a simple two-sector general model of an economy in a globalized world. We have investigated how well alternative shocks that have been proposed in the literature are able to explain the recent observed transformations of the labor market. Our theoretical discussion has concluded that the routinization-biased technical progress
Figure 1: Figure 7a: Comparative effects of alternative shocks on job shares (%)

Figure 2: Figure 7b: Comparative effects of alternative shocks on average wages (%)
is the only one that seems to be able to reproduce the stylized facts: rising employment
shares at the two extremes of the skill ladder, and monotonously rising average wages as
occupations become more skill intensive. Numerical simulations have been reported that
confirm this conclusion.


References


